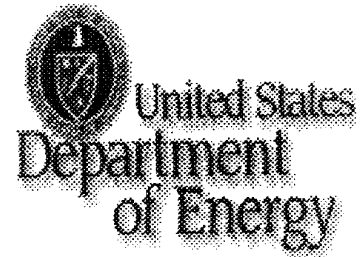
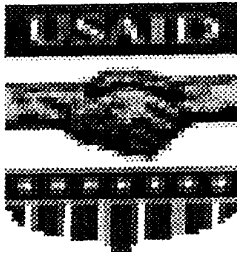


PN-ALK-255



USAID/USDOE

CENTRAL AMERICAN

ENERGY SECTOR

ROADMAP

In the wake of the disaster of Hurricane Mitch, a team of Energy sector experts was sent to visit the Central American region in April 1999 as part of the assistance offered by the United States Government. This team followed up commitments made by the President of the United States as well as the Secretary of Energy to help in the reconstruction and redevelopment of the region's energy sector. The team recognizes the potential for occurrence of further regional natural disasters similar to Mitch. As a consequence, analysis and recommendations of actions were constructed with environmental and economic sustainability in mind. In turn, the actions will mitigate regional vulnerability to energy sector destruction caused by future natural disasters. The following discussion – known further as the roadmap document – presents a set of options to the decision-makers of the region, donor agencies, and other interested stakeholders in the region's energy sector future.

Currently, the Central American region is in a dynamic period of change and reform. The governments of Guatemala, El Salvador, Honduras, and Nicaragua have undertaken major efforts at regulatory reform and privatization of their respective energy sectors. These efforts, while creating an atmosphere of excitement and growth for the energy sector, have also spawned new difficulties. These difficulties have the potential to exacerbate long term environmental and economic challenges, as related to the energy sector, as well as produce greater social inequities within the local countries. Outcomes such as these will diminish regional resistance to natural disasters. The roadmap team thus recommends that future energy sector strategies for the Central American region take measures to address the following areas:

- 1. Regional integration and harmonization of national policies.*
- 2. Resource diversity and fuel source management.*
- 3. Universal coverage in a privatized sector.*

The recommendations included in this roadmap focus on the long term developmental goals of universal access to electricity for the region's citizens that is both environmentally and economically sustainable. The roadmap document promotes this goal by addressing the above listed areas. Focusing on these broad regional needs has helped to identify a context in which to place short- and medium-term decisions. This context led to the set of recommended options contained in this document for short- and medium-term actions to be taken by regional decision-makers. These options must be recognized for the long-term benefits. When put into action, they will forge a more disaster resistant and climate friendly Central American energy sector.

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I. EXECUTIVE SUMMARY

During April 11-25, 1999, USAID and USDOE sponsored an interagency energy sector mission to the Central America countries of (in order visited by the team) Guatemala, El Salvador, Honduras and Nicaragua. The team met with local utilities, relevant government ministries, NGOs, regional and international organizations, and members of the local and international (including finance) private sectors.

The purpose of the mission was to study regional energy issues firsthand and to develop a series of mid- and long-term recommendations. These recommendations were published in a document known as the Central America Energy Sector Roadmap. The Roadmap explains how donor agencies, multi- and bi-lateral investment banks, the private sector and the host-countries might provide assistance to reach these objectives.

The development of the Energy Sector Roadmap for Central America comes at an exciting and critical time for the region. A significant wave of privatization in the energy sectors of Guatemala, El Salvador, Honduras and Nicaragua have improved energy service. This will not only promote cost effectiveness, but it will also translate into improved opportunity for economic development for the Central American region. Initiatives for regional development of electricity and natural gas infrastructure also promise to contribute to improved efficiencies, reduced environmental impacts and enhanced energy security.

The road ahead, however, is long and full of obstacles. For example, the rate of electrification for the region as a whole is only around 50%. Also, some restructuring and privatization efforts in the region are uncertain and unclear. This lack of transparency inhibits private investment because of perceived risks and costs of investing in the Central American economies. Finally, environmental considerations, energy diversity and energy security policies are not being fully addressed as the regional trend shifts toward thermal generation and away from hydroelectric and other indigenous renewable energy resources.

The Roadmap Team developed recommendations that focus on Energy sector development that is private sector driven, climate friendly, and aspires to universal access to electricity for all Central Americans. This Energy Sector Roadmap for Central America is a direct response to the "Call to Action" stated at the United States Government Inter-Agency meeting on the aftermath of Hurricane Mitch on December 15, 1998, in Washington D.C. It is intended to advance USAID's "Mitch" activities in economic reactivation, infrastructure building, and climate change. This commitment has been followed up by significant visits to the region by the President of the United States and the Secretary of Energy in March of this year.

A. LIST OF ACRONYMS

AMM	Administrador de Mercado Mayorista (Wholesale Market Administrator)
CDM	Clean Development Mechanism
CEL	Comision Ejecutiva Hydroelectrica del Rio Lempa (Executive Hydroelectric Commission of Río Lempa) – El Salvador
CNE	Comision Nacional de Energia - Honduras
CONEE	Comision Nacional de Energia Electrica (National Electric Energy Commission) – Guatemala
CONADES	Comision Nacional para el Desarrollo Sostenible (National Commission for Sustainable Development) – Nicaragua
DSM	Demand-Side Management
EEGSA	Empresa Electrica de Guatemala SA (Electric Company of Guatemala)
ELCOSA	Electricidad de Cortés SA (Cortes Electric Company) - Guatemala
ENEE	Empresa Nacional de Energia Electrica (National Electric Energy Company) – Honduras
ENEL	Empresa Nicaraguense de Electricidad (Nicaraguan Electric Company)
FINET	Fondo Nacional de Inversion en Electricidad y Telecomunicaciones (National Investment Fund for Electricity and Telecommunications) – El Salvador
FISDL	Fondo de Inversion Social para el Desarrollo Local (Local Social Development Fund) – El Salvador
GOE	Government of El Salvador
GOG	Government of Guatemala
GOH	Government of Honduras
GON	Government of Nicaragua
IDB	Inter-American Development Bank
INDE	Instituto Nacional de Electrificacion (National Electrification Institute) – Guatemala
INE	Instituto Nicaragüense de Electricidad (Nicaraguan Institute of Energy)
ISO	Independent System Operator
JI	Joint Implementation
MEM	Ministerio de Energia y Minas (Min. of Energy and Mines) - Guatemala
MW	Megawatt
NGO	Non-governmental Organization
OGIC	Oficina Guatemalteca de Implementacion Conjunta (Joint Implementation Office of Guatemala)
PV	Photovoltaic cells
RET	Renewable Energy Technologies
SIEPAC	Sistema de Interconexion Electrica para America Central (Central American Electrical System Interconnection)
SIGET	Superintendencia General de Electricidad y Telecomunicaciones (Superintendency of Electricity and Telecommunications) - El Salvador
USAID	United States Agency for International Development
USDOE	United States Department of Energy
UT	Unidad de Transacciones (Transaction Unit) – El Salvador

II. INTRODUCTION

From October 24 through November 1, 1998, Hurricane Mitch ravaged the Caribbean and Central America as one of the strongest and most damaging storms ever to hit the region. Honduras and Nicaragua were hit hardest, followed by Guatemala and El Salvador. The energy infrastructure in some of these countries was severely damaged; pre-Hurricane energy service in these four countries was already lacking. Rural communities suffered significant loss of existing technology infrastructure and severe damage to water and land resources.

Perhaps the most poignant result of the damage levied by Hurricane Mitch was the recognition that the region's overall infrastructure is far from disaster resilient and the odds of a repeat of the severity of Mitch's damage or even that of a lesser storm, are high. Both host-governments and the donor community need to focus on programs that will encourage "smart infrastructure" that will avoid the dangers to life and community that have wreaked havoc throughout the region to date. The Hurricane has especially brought to light the importance of integrated resource planning, regional grid planning and placement of rural energy and other infrastructure.

The aftermath of Hurricane Mitch presents an opportunity for the nations of Central America. With the cooperation of the United States, multi-lateral lending agencies, and worldwide donor agencies, the damage will be replaced with new advanced, efficient and environmentally sound energy technologies. The opportunity exists for these entities to not just rebuild the energy infrastructure of Central America, but to enhance it with one that is more efficient, natural disaster resistant, and environmentally friendly.

On March 8-11, 1999, United States President Bill Clinton visited the four Central American countries struck by Hurricane Mitch to view the devastation caused in October 1998 and to "aid the region's recovery and reconstruction and to support continued transition to peace, democracy and open markets." President Clinton has asked Congress for approximately \$965 million in emergency supplemental funding for reconstruction efforts in Central America to promote long term recovery and development; some of this funding has been earmarked for the region's energy sectors.

The restructuring and privatization process for the electricity sector in Central America has largely taken place without incorporating mechanisms for addressing public policy objectives, other than providing some funding for rural electrification. It is imperative that mechanisms to support public policy objectives that are consistent with competitive energy markets be incorporated in these restructuring and privatization efforts. These mechanisms need to be incorporated early on in the process in order to avoid and minimize distortions in electricity markets. They should include policies to support assistance for low-income consumers, resource diversity, energy efficiency, demand side management, and reduction of environmental impacts should be considered. Technical assistance and training for policy makers and regulators on these issues is needed.

The Central American region is still seen as a risky investment since privatization of the energy sector is very new and fragile. There is also a lack of available financing in the region for traditional power projects. As the region is privatizing its generation and distribution systems, most new power sector investment will be made by the private sector, including foreign investors. They will be able to access credit from international banks. The recently privatized utilities will still want to compete in the power market, and will look to multilateral institutions for project financing.

Longer term energy assistance activities could include the formation of a regional framework for the strategic planning of the energy sector on a regional basis and the publishing of a regional portfolio of possible projects within the indicative plan for consideration by investors in large bilateral or multilateral projects.

III. SHORT AND MEDIUM TERM ENERGY ISSUES

Increasing population rates and subsequent high demand for power are anticipated throughout the region; it is expected that GDP and exchange rates will remain stable and that privatization of the power sectors in these countries will be completed in the mid-term. The team's visit confirmed that the emphasis of post-Mitch assistance should be on the mid- to long-term government reform of energy sector policy, including regulatory reform, private investment to the sector, and regional cooperation. Currently, Guatemala and El Salvador have similar policies and privatization programs and Nicaragua is beginning to privatize. However, restructuring and privatization efforts in Honduras are uncertain. This lack of consistency and unclear commitment to fundamental reform of the electricity sector inhibits private investment and increases the risk and cost of investing in Central American economies. The US Government should facilitate policies that support private investment and development of competitive electricity and energy markets at a regional scale.

A. Regional Integration and Harmonization of National Policies

Even pre-Hurricane Mitch, the countries of Central America recognized, with the support of the Inter-American Development Bank (IDB), the utility of a regional grid¹ that would promote reliable provision of energy services and capitalize on the energy economics of the region. It is expected that a regional market of 35 million people will attract new investments that can take advantage of economies of scale and support development of regional projects that cannot be justified if development takes place on a country specific basis. Currently, regulations are not consistent or compatible among the countries to support regional electricity or natural gas development.

Central American energy integration will promote competition between energy suppliers of the region and increase energy security and reliability of energy supplies to individual countries. Other benefits for the region include savings in petroleum products used to generate electricity, which could help lessen the region's exposure to

¹ The extensive damage caused by Hurricane Mitch and the fire that closed down generating capacity at the El Cajon hydroelectric generating station in Honduras has again drawn focus to the benefits of regional electricity interconnection in Central America.

international oil shocks, and an improvements in balance of payments due to decreased imports of petroleum products. This increase in market size and promotion of competition is contingent upon the countries allowing flexibility in the use of interconnections so large users and distribution companies to select their energy suppliers among competing regional energy companies.

Recommendations

- Support electricity generation and transmission companies' efforts to promote line connections within countries and cross-border.
- Support consulting and assistance programs via USAID and other donor agencies to promote aid in the development of appropriate regional and local legal, institutional and technical mechanisms to encourage private sector participation in the development of a regional energy grid.
- Assess a natural gas pipeline option (Mexico and Colombia) as one method to reduce electricity prices and improve environmental impacts. The US government can provide political support and encouragement for advancement of the gas pipeline projects currently under proposal. Successful examples of cross-border energy trading include: 1) Mercado Comun del Sur (Mercosur – *Southern Common Market* of South America); 2) North American Regional Market (U.S. power pools and ISOs); and 3) U.S.-Canadian cross-border electricity and natural gas trade.

1. SIEPAC: Central American Electrical System Interconnection

The Central American Countries Interconnection System (Sistema de Interconexion Electrica para America Central) (SIEPAC) ²intends to interconnect the Central American countries through a US \$350 million, 1,800 km. Long, 230 kV transmission line with a regional control center. The complete main transmission line will link six Central American countries (El Salvador, Guatemala, Honduras, Nicaragua, Costa Rica and Panama).

Recommendations

- Continue to provide U.S. government political support and encouragement for the development of SIEPAC through mechanisms such as the *Hemispheric Energy Initiative* and regional bilateral discussions.
- Support development of consistent legal, regulatory and institutional frameworks that support private investment in the regional energy infrastructure, including development of SIEPAC.

² There are three qualifications for SIEPAC: 1) No country may block electricity across its border; 2) No country may tax the transmission service through its territory; and 3) Countries need consistent and compatible regulatory policies and technical standards, including effective dispute resolution mechanisms.

The regional network will enable the six countries to better manage their electrical resources and could eliminate the need for some new generating capacity. The capacity equivalent of the line is 300MW.

2. Bi-Lateral Connections

There are existing interconnections that have formed the beginnings of a regional transmission system that is promoting new generating facilities, wholesale energy markets across national borders, reduced environmental impacts, and exploitation of regional and seasonal load diversities.

Recommendations

- Development of the regional transmission network based on these bi-lateral connections could cause system stability problems because of the lateral nature of the transmission network. Although the SIEPAC interconnections system is being established, some local transmission lines within countries of Central America need to be upgraded and a second transmission line added where needed to ensure stability.
- Assist countries in the purchase of a (SCADA) computerized telecommunication systems and metering systems to support development and operation of the interconnection system.
- Aid the grid interconnection project between El Salvador and Honduras through assistance and support.
- Support regional grid connections that have the potential to spur "economies of scale" returns to private investors. This will enable a regional power market to be formed, thus reducing risks to the investor and increasing opportunities for credit.

3. Policy and Regulatory Harmonization

The current state of development of energy sector restructuring and regulation in the region is incomplete and inconsistent. Guatemala and El Salvador are most advanced. Nicaragua has passed legislation and is developing a program to restructure and privatize parts of its electricity sector. Honduras has passed restructuring legislation but is only beginning to develop implementing programs.

All of the countries visited by the joint USAID/USDOE team are in favor of the development of a regional electricity transmission grid and are interested in pursuing options for development of regional natural gas pipeline projects. Regional governments also recognize the need for private investment to support development of these regional projects.

Cooperation among the countries of Central America and development of consistent and compatible policies and programs is needed to facilitate development of a regional energy infrastructure. Moreover, development in the short-term of domestic policies, institutions and infrastructure needs to be strengthened in order to support development of the longer-term regional energy projects.

Recommendations

- Support the formation of a regional regulatory entity, as a part of SIEPAC, that will oversee the energy market between the countries and provide assistance for drafting of individual country regulations so that the same are complementary and will allow for the regional marketing of energy.
- Assist in strengthening power pooling and wholesale markets that provide arbitrage opportunities for electricity sales. Although these markets exist at different stages in all four countries, the formation of new markets should be encouraged.

B. Resource Diversity and Fuel Source Management

Energy resource diversity enhances country energy security by mitigating the potential impacts of world energy market fluctuations and helps reduce susceptibility to damage from natural disasters. Fuel diversity (i.e., liquid petroleum products, natural gas, biomass, geothermal steam, etc.) promotes competition between energy suppliers. The development of renewable energy technology (RET) based energy sources as part of a cost-effective fuel mix portfolio should be promoted.

Recommendations

- Include indigenous, renewable energy resources in power supply portfolios. This should be done for the following five reasons: 1) RETs cannot be interrupted by political forces from outside of the country. 2) RETs keep energy payments circulating within the host country. 3) RETs form the basis for direct internal employment. 4) RET's are often local in nature and/or serve remote areas, making them less susceptible to damage from hurricanes and other natural disasters. 5) RETs can be disbursed in a distributed fashion, thus reducing overall electrical extension costs that can result from building extensive grid lines into remote areas.
- Conduct a study to examine the possibilities that exist for hybrid power generation projects. For example, due to seasonal variation of wind speed and precipitation in Honduras, wind and hydropower are complementary.
- Use geothermal energy throughout the year, since it is independent of climactic conditions. It is well suited for base-load electricity generation, but there are cases where it is used in load-following operations.
- Promote the development of distributed generation technologies, including RETs, fuel cells, and indigenous energy resources.

1. Natural Gas Sector

Projects to develop natural gas pipelines from Mexico and Colombia to Central America are under discussion. The introduction of natural gas supplies (or the delivery of natural gas via pipelines) to Central America is evolving into a two pronged approach

with competing projects and supplies from both the northern and southern route. The northern route is a proposed natural gas pipeline from Ciudad Pemex in Mexico's Tabasco State to Central America. The southern pipeline proposal would bring natural gas in an underwater gas pipeline from Colombia up through Panama and Costa Rica. If implemented, these projects would increase the fuel diversity of the region and provide significant environmental benefits by displacing oil-fired generation and providing support for the introduction of high-efficiency combined-cycle and other gas based technologies.³ The nations of Central America have expressed interest in the development of these natural gas pipeline projects.

Recommendations

- Assess the market viability of the pipeline proposals. This analysis should incorporate cost-benefits to the regional power market and should consider the opportunity cost (the loss of what could have been gained) of not introducing natural gas supplies to the Central American countries. Regional electricity system integration is needed to support large-scale generation projects that are necessary for the execution of the gas pipeline. The economic viability of natural gas for use in electricity generation should be evaluated in light of the SIEPAC interconnection system that might be completed by the time the proposed pipelines are constructed.
- Encourage the private sector to take over the proposed gas pipeline project while continuing to yield government support. In order to facilitate regional plant conversion to natural gas, regional electricity system integration needs to occur to support large-scale generation projects.
- Encourage regional governments to develop energy policies that promote the development of a natural gas grid in Central America. The creation of the regional pipelines will be a result of political will and a favorable political setting.
- Assist in harmonizing natural gas policies and regulations among the Central American countries to promote development of the energy grid. Facilitating natural gas supplies for the region will require agreement on tariffs, environmental assessments, rules on trade and technical standards.

2. Renewable Energy Use

As observed by the team, perhaps most fundamental to the development of the region's energy sector is a tendency to favor grid extension into rural and outer communities with little consideration to distributed generation and development using non-conventional energy resources (i.e. renewable and clean energy technologies).

The governments of the nations of Central America need to develop a more coordinated and long-term approach to rural electrification that includes promotion of grid and off-grid renewable energy technologies. Information should be provided to the

³ Any natural gas pipeline would initially depend on electricity generation as its primary source of demand but any new generating facility developed to utilize this gas would likely be too large to serve a single domestic electricity market.

Central America governments as to which technologies are most cost effective for rural electrification.

Recommendations

- Work with financial institutions to develop financing programs with payback periods that extend beyond the present 5 to 7 year terms. Present programs strongly favor the development of thermal facilities over renewable and other technologies, as the regional power generation mix overall favors thermal generation. This trend impacts both regional energy diversity and regional energy security. Efforts should be made to level the playing field so that all technologies can compete to provide needed capacity additions.
- Integrate renewable resource information with digital mapping activities that are already underway in the region, for use by both the public and private sectors to determine locations for high-value renewable projects. This has been proven very effective in several countries, including Dominican Republic, Indonesia and the Philippines.
- Use of well-managed renewables in protected areas can help conservation organizations achieve their goals, while serving as models for local communities to adopt more systems. Pilot projects through the PROARCA/CAPAS program can serve as an excellent means of communicating and demonstrating renewables to conservation organizations in all countries.
- Training and building capacity for suppliers, through partnerships with U.S. businesses, will increase improve competition and foster growth in the market. Stronger competition among suppliers of stand-alone renewable technologies is critical for the region.
- Promote cogeneration among large users, such as sugar, cement, hotel and steel industries. As an example, a sugar mill in the Dominican Republic powers itself, a thermal energy based industrial operation, and the supporting workers community.
- Consider marketing RET generated electricity to US sponsors of region's maquila operations. Incentive could be US or European "green" public relations.
- Consider sale of RET back-up systems to maquiladoras. These can be cost-effective when used as a reliable power source for lights, sewing machines, etc. This could be done as a business by a firm contracting the service to a group of operators in a zona franca, for example.
- Use RETs in integrated development efforts through electrification systems, which is an economic development driver. In the particular case of geothermal, this can be accomplished through projects that directly use the heat of the earth for drying forestry and agriculture products, raising fish and shrimps, etc. This can come in the form of agricultural development (electrifying water pumps), rural school, health

clinic, and telecommunications electrification, as well as local direct-use geothermal energy projects. Funding for RETs and distributed power can be leveraged through financing mechanisms that specifically address the above listed needs.

3. Energy Efficiency

Increased Energy Efficiency should be a priority policy goal in the Central American countries visited by the Mission.⁴ Energy Efficiency can make supply side contributions by mitigating or postponing the need for new power generation.

Recommendations

- Encourage optimal energy efficiency via legislation or regulation. Standards and labeling for energy efficient equipment, and building energy codes could be utilized and implemented.
- Conduct a study to examine the role of legislation and regulation in helping the Central American countries achieve energy efficiency objectives. Consequently, recommendations could be made for legislation and the implementing of rules and regulations.
- Funding for the establishment of Energy Service Companies (ESCOs) should be considered by Multilateral Development Banks and donor agencies. Private ESCOs would focus on the weatherization of public buildings, hospitals, hotels etc. They could also focus on the retrofitting of old boiler systems, HVAC systems and other energy intensive systems in public buildings, hospitals, government buildings, etc.
- Assess the root causes of theft of electricity (i.e. via illegal line connections) and its social implications, as there are reportedly high rates of electricity theft in the region.

C. Universal Coverage in a Privatized Energy Sector

Effective competition for generation, transmission and distribution systems is underway in the region through the sale of the assets of the formerly state-owned companies to the private sector, including foreign investors. These investors offer to provide the lowest price to the consumers or the highest price to the government for the concession. There are several crosscutting regulatory issues that are affected by this current practice.

Recommendations

- Once investment programs are defined, the regulatory agencies must enforce the new company's obligations to serve in their new territories. The development of programs for regional regulatory personnel that emphasize the development and training needed

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In El Salvador, the Ministry of Environment and Natural Resources is in discussions with FIDE in Mexico to learn more about their energy efficiency programs.

to effectuate asset sales, grant concessions, and effectively monitor private sector operation of these assets will assist investment activities.

- Least cost comparison studies between grid extension and distributed power must be undertaken. It is often the case that the cost of constructing new transmission lines and distribution systems, along with the cost of fuel, may be very high in comparison to the use of distributed power. This is especially the case when electrifying lightly populated, low energy consuming communities. In many cases, distributed generation is more economical than extending the grid into areas where population densities are low and electricity consumption low. Examples exist in Brazil and South Africa today.
- Assistance should be given to Central American countries to fully develop comprehensive anti-trust laws to protect market development and the consumers.

1. Natural Resource Management

Effective natural resource management is a key factor in improving the quality of life and protection of the resource for future generations. Management programs must be implemented which will yield long-term benefits contributing to the sustainability of the resources. Central American countries are largely dependent on imported fossil fuels (primarily oil), geothermal and hydroelectric resources for meeting energy needs. There are no significant indigenous fossil fuel reserves, placing a heavy burden on foreign exchange requirements. Effective management of the internal resources is extremely important for sustainability. Human activities, a lack of coordinated protection efforts and natural processes are leading to the degradation of available resources, particularly in the areas of land and water quality.

Recommendations

- Enhance effective decision making with the development of integrated, inter agency natural resource data collection systems and information retrieval systems (Geographic Information Systems). Socioeconomic, energy requirements, land use and cover, topographic, hydrographic, meteorological, water quality, air quality and natural resource information, as well as information on energy supply and demand could be incorporated into the database. The system would need to be developed with information at a sufficient degree of resolution to permit effective use. For example, the topographic information would need to be represented in sufficient detail to determine locations suitable for consideration of small hydro development. The database should be designed to permit the evaluation of renewable energy technologies in advancing rural electrification. Such information systems can be used in energy planning, siting of generation plants, identification of rural electrification priorities, and resource evaluation and monitoring.
- Strengthen institutional capabilities that are responsible for collection, storage and analysis of natural resource information in order to maintain a useful natural resource information database.

- Countries should prepare an overall energy and natural resources management plan, which identifies critical needs, and the costs and benefits of conducting such programs. Such plans should be revised periodically to reflect changing priorities and objectives and should prioritize programs for achieving short, intermediate and long term goals. Incorporating an information management system in the plan is vital to its effectiveness.
- Investigate and determine those policies and practices that encourage use of fuels that contribute to deterioration of air quality. Subsidies on diesel fuel assist transportation companies, but monies for subsidies may be better invested in development for use of clean technologies (natural gas, for example). Use of clean fuels for thermal generation need to be encouraged through market incentives.
- Aggressive watershed management plans need to be developed and implemented. For regions heavily dependent on hydro resources, specific programs need to be developed to address reforestation, re-vegetation, and land use concerns, directed primarily at reduction in soil erosion for the preservation of surface water quality. Programs at the municipal level are most effective at addressing such items, but coordination, direction and encouragement needs to come from the national level. Programs to discourage or to police indiscriminant land clearing for agricultural use need to be implemented. Standards for construction with respect to soil erosion control need to be enforced. Programs should be considered for (1) the development of waste water treatment for large urban areas, (2) for providing smaller communities with "package" wastewater treatment plants, and (3) for enforcement and policing of effluent standards for point sources of pollution. Such items are recognized priorities for Central American countries, but lack of funding for such programs are an impediment to their execution.
- Actively promote the availability of natural gas in small communities; provide gas burning cooking stoves to discourage woodcutting.

2. Rural and Urban Electrification Issues

Great deficits in electricity coverage are present throughout Central America. Creative solutions need to be applied to reaching the underserved electricity consumers of the region. It is important that a mixed portfolio of project designs be implemented to address these needs. Below are listed a variety of suggestions for addressing this objective.

Recommendations

- Opportunity exists to develop small fuel cell projects located in the municipal landfills of Central America's larger cities. These landfills, usually just open dumps, generate large quantities of methane - a large contributor to the greenhouse gas effect. Extracting methane from these areas can be used to generate significant quantities of clean power, primarily through application of fuel cell technology. This technology

can produce clean, efficient, and environmentally friendly energy, while taking advantage of a resource that would otherwise be lost.

- Compose a comprehensive regional study on the crosscutting topic of rural electrification. The report should examine the costs and benefits of achieving rural electrification objectives by grid extension vs. distributed generation. The report should include financial comparisons that cover depreciation costs of various technology options (i.e. thermal vs. renewable energy generation projects), externality costs such as environmental impacts, balance of payments issues, energy security issues and infrastructure disaster resilience.
- Work with cooperatives, leveraging their existing infrastructures to install/promote/finance SHS and mini-power plants. Working examples include coffee growers in Guatemala and sisal producers in Brazil.
- Increase communication between government organizations to link rural electrification activities with other social development such as the construction of schools and rural clinics, with the provision of energy. The comparative economics of grid extension and smaller distributed systems in rural communities must be examined. In the Philippines an Australian donor package was combined with a loan to municipalities to electrify, via PV, local schools, clinics and a water system. The loan will be partially repaid through 1) renting the clinic's vaccine refrigerator for 27 - 28 days each month to local beverage vendors, and 2) by showing videos for a fee to audiences in the school on weekends. These efforts can lead to development of strategies for electrifying off-grid rural homes.
- Form off-grid utilities for rural areas. Models already exist in the region (SOLUZ). Start-up costs for off-grid utilities can be supplemented by one-time subsidies nominally given to make grid connections.
- Encourage the formation of cooperative associations and support existing associations for electricity. Competition in wholesale markets is limited to power producers with a specifically sized MW portfolio. For example, production of at least 5 MW is required to enter the market in El Salvador. To register for and compete in the wholesale power markets, small power / renewable power producers need to unify their businesses through a legal association. This will enable them to sell their power nationally, and to avoid being shut out of the market.
- Support development of co-generation and distributed generation, along with clean technology transfer for industrial power users to open a market niche for credit. Local banks may be able to finance power projects if they are tied to a specific consumer with productive industrial uses for the power.
- Supplement off-grid utility operational costs with payments from the government to supply energy for legitimate social services such as health, water, education, and communications.

3. Off-Grid Applications

A variety of technologies exist that can bring electricity to both urban and rural communities without needing to extend the electrical grid. These distributed technologies are reliable and often cost effective. The comparative economics of grid extension and smaller distributed systems in remote communities should be examined.

Recommendations

- CONADES can serve as a conduit through which off-grid programmatic activities are formed and refined to assure that they are addressing relevant needs. Although they do not have any implementation capabilities, they can provide a communication link between government, academia, and the private sector.
- Support mini-grid application through the use of biomass materials such as bagasse.
- Work with traditional utilities that are not interested in distributed generation to develop business plans for profitably installing/servicing RET distributed generation in their service territories. COELBA in Bahia, Brazil is an example.
- Provide assistance toward the establishment of a microenterprise fund for rural electrification.

IV. Long Term Energy Issues

A. Disaster Mitigation

Central America is one of the world's more vulnerable areas to natural disasters due to its climatic, geologic, and geographic characteristics. In an effort to save lives and diminish property loss, proactive strategies should be initiated to mitigate the extent of the damage that can be caused by future natural phenomena. Clearly, some adverse effects cannot be deterred. The amount of damage sustained due to a natural disaster can be decreased, however, by advanced preparation. The ultimate objectives for any disaster preparation policies are to reduce the loss of lives and the amount of damage sustained to infrastructure and private property. A well-implemented emergency preparedness plan along with a strong disaster mitigation program will reduce the reconstruction costs related to any given disaster.

Recommendations

- Develop emergency preparedness plans (which may include systematic shut down of power plants, opening of dam gates and other measures to protect the infrastructure heavy equipment from back surges) and other events for the generation plants. These plans will be coordinated with the National Emergency Control Center for protection of the grid and generation equipment.
- Prepare contingency plans for the generation, transmission and distribution portions

of the energy sector. In case infrastructure is destroyed, these contingency plans must address alternatives and pathways to bring back services on line as soon as possible.

- Identify and restrict development of high-risk areas for residential uses as well as industrial and infrastructure activities.
- Develop a program to bury distribution lines to decrease vulnerability of the grid to falling trees and debris.
- Relocate transmission towers out of flood plain areas or riverbeds.
- Design transmission lines to sustain winds of up to 125 mph and to withstand earthquakes of up to 6.5 on the Richter Scale.
- Design renewable energy technology applications for hurricane events (i.e. PV panels that can be dismounted and stored, wind turbines that can be brought out of the wind).
- Create an inventory of emergency generators (preferably those that utilize renewable energy technologies) for critical uses such as hospitals, emergency centers, refugee centers and other applications.
- Identify fuel storage sites and inventory of fuel prior to announced natural climatic events. Ensure that these sites are supplied with the pertinent fuel at all times.
- Establish systematic tree pruning programs along the major transmission and distribution lines during the off rainy or hurricane season.
- Increase incidence of distributed generation to isolated regions (this decreases their vulnerability to breaks in the grid system).

B. Training and Technical Assistance

All four countries visited by the team - El Salvador, Guatemala, Honduras and Nicaragua would benefit from technical assistance and training in their respective regulatory and policy planning agencies. Technical assistance and training will help these agencies to further their knowledge of policy options that will support privatization, rural development, technology diversity, and development of regional electricity and natural gas markets. Further assistance could include training the regional regulatory agencies in the areas of wholesale energy markets, wheeling, dispute resolution, and tariff stabilization. Regional training needs include:

- Technical Training for personnel in the Wholesale Markets
- Training for personnel in the policy making bodies of the Central American countries
- Technical Training for Grid personnel
- Develop education programs as soon as possible. Many USAID-sponsored educational materials exist that are well suited to contain renewable energy. For

instance, materials used in El Salvador to explain water pumping and purification, health centers, and watershed management could easily include energy components.

- The existence of a strong network of micro-enterprises is the key to the sustainability of rural energy supply. On both a regional and local basis, the training and strengthening of technicians will allow continued sustainable and market growth.
- The environment is ripe for development of a comprehensive education program on energy conservation (demand side management). Assistance should be given to Central American governments to launch an aggressive energy conservation campaign. In effect, this will provide consumers the information and means to understand and better control their rising electricity bills.

Recommendations

- Develop a comprehensive regional energy sector technical assistance and training program that leverages the funds and personnel of current multilateral bank and donor agency programs. This recommendation is based on interviews with the Inter-American Development Bank and the World Bank who have been developing programs designed to strengthen the regulatory and policy institutions of the Central American countries by providing technical assistance and training needs.
- Multilateral Development banks and donor agencies should consider the funding of "Energy Awareness" campaigns. This would initiate a broad public awareness through targeting school and church based education programs to prepare and teach consumers how to reduce energy bills. Additionally, development of Labeling Codes much like the "Energy Star" program of the US Environmental Protection Agency should be considered.
- Form partnerships between US distribution companies and newly formed distribution companies (USEA / EPP). Consequently, lessons learned by the US companies can be shared with the new companies.

C. Climate Change Impacts

Global Climate Change and the Flexibility Mechanisms

Joint Implementation and the Clean Development Mechanism are creating long term economic incentives for clean power development. Due to the potential necessity of carbon intensive energy producers to reduce their carbon emissions, a legitimate need for flexible mechanisms to finance such changes is present.

The rapid privatization of the regional energy sector has created an opportunity to promote the adoption of these financing mechanisms. These mechanisms offer a potentially lucrative vehicle for financing clean power projects - both by governments and private developers

Regional Recommendations

- Support regionally integrated joint implementation offices that can quantify, inventory, and account for all possible carbon credits available for trade.
- Create a futures / derivatives market for carbon credits ("green options") - where credits can be sold by the producer for a monetary value today, while the consumer can conveniently redeem the carbon value of the credit.
- Return the economic value of carbon credits earned by clean power developers to the producer of such gains in order to encourage re-investment in more clean projects.
- Quantify gains in energy efficiency as a potential source of carbon credits (these can come from energy efficiency improvements of national electric grids).
- Encourage regional governments to trade carbon credits for hard currency, and invest this currency in sustainable development projects (i.e. renewable energy).
- Support clean power projects that promote natural resource conservation (i.e. watershed reforestation + hydropower), to earn extra tradable credits.

*Country-Specific Recommendations**Guatemala*

- Use the flexibility mechanism office (OGIC) as a model for the region, since it has already quantified its sellable carbon credits.
- Create an interim carbon credit inventory period, as a gap in the accounting of potentially tradable credits is about to occur. OGIC has suggested the creation of this inventory.
- Use potential energy efficiency gains, especially in the electricity grid, to maintain carbon credits.
- Trade the credits earned from carbon sinks for hard currency to finance clean power projects.
- Continue to develop the four specific joint implementation projects and the four others (in the planning stages) identified by OGIC.

El Salvador

- Support the national utility (CEL) in its efforts to gain credit for its geothermal projects since the inclusion of private sector power producers is vital.

- Train and support the "Clean Development" office that exists in the Ministry of Natural Resources and Environment (it has a 20 year plan for implementing the flexibility mechanisms).
- Develop methods for project developers to receive sellable carbon credits for their efforts in operating small, clean powered, hydro projects and in supporting watershed reforestation.

Honduras

- Assist the "energy cabinet," who makes all the major energy decisions, in receiving flexibility mechanism training.
- Publish the Short Term Marginal Cost of electricity in a government report, to enable the many private sector renewables companies to compete in the marketplace - this will allow carbon credits to be earned by these renewables companies.
- Continue the development of hydro generated power. This could yield a significant amount of carbon credits in the future.
- The maquila (user of 15-20% of total national energy consumption) could co-generate at its factories and get carbon credits for this.

Nicaragua

- Establish a joint implementation office with the support of NGOs and the private sector.
- Consider the National Commission of Energy (public sector) a potential partner. As a partner, it will allow them to use the carbon credits to reduce the cost of financing its projects.
- Explore the offers of private sector banks to finance clean energy projects, if these projects independently generate power for a specific industrial customer. This offers a good opportunity to exploit both the flexibility mechanisms and technology transfer.
- Develop plans for the creation of a regional "futures / derivatives" market for carbon credits (i.e., sale of carbon sequestration credits earned from preservation of national forests) endorsed by the "Central American Private Payment System."

V. COUNTRY SPECIFIC INFORMATION

The following section should serve as a complement to the above stated recommendations. This information will help the reader to understand in greater depth the relevant data and summaries of each of the four countries discussed in this document.

A. Regional Energy Sector Matrix

Country	El Salvador	Guatemala	Honduras	Nicaragua
Unbundling of energy sector completed	x	x	Legislation being drafted	Expected to be completed by April 2000
Total privatization of the Generation Sector	x (except hydro generation)			
Some Generation privatized		x	x	x
Transmission network system privatized				
Separate Market Administrator	x	x		pending
Distribution sector privatized	x	x	pending	pending
Policy Incentives for Renewable Energy development			x	x
Clear policy objectives for rural electrification	x	x	Yes but unfunded	Yes but unfunded

B. GUATEMALA

Data

Population: 9,744,000

GDP per capita: \$1300

Rural Pop. 40%

Pop. With Electricity: 63%

% Rural Electrified: 25%

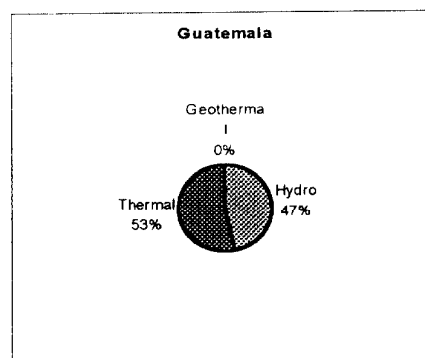
Capacity of Installed Elec. 1224 MW – 48% hydro

Hydrocarbons: Domestic oil production is 40,000 b/d

Hydro: Guatemala has an untapped potential of 4,000 MW for hydroelectric generation.

Geothermal: Guatemala has an estimated potential for 600 MW of geothermal and 1,500 MW of total electricity generation.

Solar, wind, biomass: Extensive biomass generating potential likely exists in the sugar and wood processing industries.



Minister of Energy and Mines: Julio Campos
Minister of Finance: Pedro Miguel Lampart
Secretary of Planning and Programming Ricardo Quinones

National Electrification Institute (Instituto Nacional de Electrificacion) (INDE) –
Rodolfo Santizo, President

Country Summary

The GOG is proceeding to restructure its electricity sector by unbundling the government-owned electricity sector--made up of the Electric Company of Guatemala (EEGSA) and the National Electrification Institute (INDE)--into generation, transmission and distribution. The privatization of generation and distribution assets has occurred. This has created open competition in generation, open access to transmission lines, and creation of a wholesale electricity exchange. A part of the revenue from the sale of INDE's assets will support development of rural electrification and renewable energy.

The GOG also established the National Electric Energy Commission (Comision Nacional de Energia Electrica), which is part of the Ministry of Energy and Mines (MEM), to regulate the sector. The jurisdiction of the Commission includes setting transmission and distribution rates and ensuring open access to the transmission grid.

The wholesale market ⁵ administrator is developing a spot market for electricity and is developing methods for providing ancillary services (e.g., spinning reserves, load following, stability service). End Users can contract for base load and intermediate load and purchase peaking capacity on the spot market using an energy broker. The wholesale market administrator is responsible for dispatch and system reliability.⁶

A partnership made up of TECO Power (U.S.), Coastal Power (U.S.) and a local Guatemalan partner is developing a coal-based project. While the technology being used is not state-of-the-art, it does meet the World Bank standards for air quality emissions. New and novel technologies developed under the USDOE Clean Coal Program, such as fluidized bed combustion, would probably be more environmentally benign and not necessarily more costly. The same Guatemalan partner has acquired exploration rights to a region in northeast Guatemala where oil, and perhaps coal and natural gas, may be found. This will further solidify the emergence of fossil fuel generation in Guatemala, which as long as is used cleanly will support Guatemala efforts for electrification expansion, particularly grid connected. Technical assistance to educate the investors and

⁵ There are 18 generators and 5 brokers in the Guatemala market, INDE has 40% of generation and there are 14 distributors.

⁶ Generators negotiate a wheeling rate with INDE based on an established mechanism. If agreement cannot be reached, the national regulator will resolve the dispute. The commission sets the overall rate-of-return on investment. Generators or end-users can build and own new transmission lines, but must provide open access. A generator could build a line and turn it over to INDE, which would negotiate a wheeling arrangement with no wheeling charge until line costs were recovered (similar to the Argentine model.)

generators on clean fossil fuel utilization will ensure that fossil fuels fill in their role in Guatemala's energy sector while maintaining the integrity of the environment.

Part of the revenue from the December 1998, sale of INDE's distribution assets will support development of rural electrification and renewable energy. The Ministry of Energy and Mines (MEM) is responsible for rural electrification. The MEM has not yet decided who will administer the fund developed from the sale of INDE assets to support rural electrification or what types of renewable energy resources will qualify. The purchasers of the distribution assets agreed to modernize the system and to expand the system into 15% of the rural areas. By 2002, MEM hopes that electrification of Guatemala will reach 80%. The GOG is considering creating a new office of rural electrification.

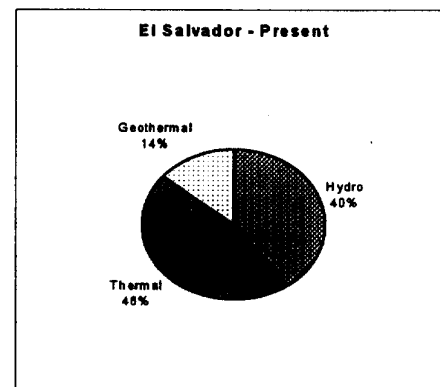
Recommendations

- Provide assistance to the Administrator of the Mercado Mayorista (AMM) – the wholesale market administrator for communication hardware (SCADAs, for example.) Technical and economic models that look at reactive power, load flow, system stability, system local losses and generator dispatch prioritization could also be developed.
- AMM uses INDE's existing control location and hardware since no control center exists. Donor agencies could provide the AMM with the assistance to build a viable control center with up-to-date technologies.
- Assist in developing a program to network regional transmission lines to decrease the fragility of the transmission system and make it attractive for private investment.
- Donor agencies should provide training in the areas of wholesale markets, tariff stabilization, natural gas related issues, and the productive uses of renewable energy.

C. EL SALVADOR

Data

Population:	5,752,067 (July 1998 est.)
GDP Per Capita:	\$1170
Rural Population	46%
Pop. With Electricity:	55-60%
% Rural Electrified:	26%
Capacity of Installed Elec.	962 MW – 40% hydro, 14% geothermal, 46% thermal
Peak Demand	800-850 MW
Hydrocarbons:	El Salvador has no meaningful resources of oil, gas or coal. Oil for power generation must be imported.



Hydro:	El Salvador's hydroelectric potential is about 1,600 MW.
Geothermal:	Total geothermal capacity for electricity generation is 500-600 MW.
Solar, Wind Biomass:	The government is encouraging sugar mills to use the byproduct bagasse to generate power.

Executive Hydroelectric Commission of Rio Lempa (CEL) - Guillermo Sol Bang, President

Country Summary

El Salvador maintains a very liberal policy framework with no restrictions on marketers, generators and distributors. There is no government energy strategy, and no mechanism through which to address market power or consumer protection issues. SIGET provides an oversight function; antitrust laws are now being considered. The energy sector restructuring model followed in El Salvador is based on those used in Argentina and Chile which include open competition in generation and distribution and open access to transmission. However, there is almost total reliance on competitive markets to achieve energy sector objectives. There is no mechanism to address competition or antitrust issues. Rural electrification appears to be the sole public policy objective specifically addressed in the country's energy sector restructuring plan.

There is no coordinated long-term planning in the sector (by private of government entities), or mechanism, other than market forces, to incorporate consumer protection, resource diversity, energy efficiency and DSM programs, etc. The Regulatory Commission is undecided whether competitive markets will adequately address rural electrification or fund the right projects. Weak government institutions and lack of a coordinated government policy for the electricity sector are inhibiting privatization efforts and delaying development of a regional energy market for both electricity and natural gas.

Rural electrification in El Salvador includes no considerations for off-grid systems. As the electric sector undergoes privatization, interest in low-consumption rural users decreases. Government social programs can play an important role in bringing energy to rural populations, for both productive and non-productive uses.

Recommendations

- Disseminate information to the government on technology applications for rural electrification funds. Information on how other countries have promoted rural electrification and other options (e.g., CDM) would be useful.
- Develop a personnel exchange program via USEA utility and regulatory partnerships to study successful renewable energy policies developed in other countries. These agencies could also provide technical assistance and training on how to incorporate environmental externalities in resource development decisions; how to value resource

diversity and use of indigenous fuels, and how to develop mechanisms that support public policy objectives that are consistent with competitive electricity markets.

- Aid the formulation of anti-trust laws to protect the end users and avoid the formation of unfair monopolies in the local energy sector.
- Assist in facilitating a partnership between Superintendency of Electricity and Telecommunications (SIGET) and a US regulatory Commission through the United States Energy Association (USEA) program.
- Promote CEL's project development potential to foreign energy investors by developing joint venture projects with renewable energy, specifically, in geothermal project development.
- Build a network of technicians, by utilizing The Confederacion Nacional de Campesinos, possibly through rural micro enterprises, capable of selling, installing and servicing small, isolated renewable energy systems.
- Formulate a program outlining effective communication mechanisms between FISDL and the Ministry for Natural Resources and the Environment, allowing the incorporation of clean energy technologies into social development programs.

D. HONDURAS

Data

Population: 5,467,000
GDP per capita: \$580
Rural Population: 56%
Pop. with Electricity: 52%
% Rural Electrified: 29%
Capacity of Installed Elec. 720 MW – 50-65% hydro; 35-50% thermal (depends on annual rainfall)

Fossil Fuels: Honduras has no meaningful proven reserves of oil, gas or coal. Oil used in electric generation is imported.

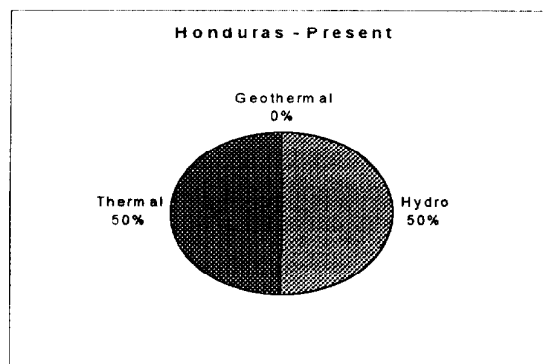
Hydro: The country has estimated untapped hydro potential of about 3,600 MW of which 437MW is being developed.

Geothermal: Honduras has undeveloped geothermal resources of about 200 MW.

Solar, wind, biomass: Extensive biomass generating potential from the sugar and wood processing industries likely exists.

Minister of Economy and Commerce: Fernando Garcia

Empresa Nacional Energia Electrica: José Manuel Arriaga, General Manager



Country Summary

Electricity demand growth is about 13% a year; about 85 MW of new capacity per year is needed. There is currently an energy shortage because of a fire in February 1999 at the El Cajon Hydroelectric Dam which represented 40% (300 MW) of the country's generating capacity. As a result, Honduras now purchases electricity from Costa Rica and Panama to make up for this loss. These purchases must go through Nicaragua, which has a weak transmission system that sometimes causes losses in transfers to Honduras.

The existing privatization law is pending before Congress. A new legislative proposal to restructure the electricity sector is expected to be submitted to Congress by the end of April 1999. The new law is expected to specify the sale of distribution and transmission assets of the state-owned utility Empresa Nacional de Energia Electrica (ENEE) and create a transmission company and a separate dispatch entity. There will be a bidding process to sell the distribution assets. The GOH also is considering development of a new law to promote renewable resources and rural electrification.

Strengthening of the recently established National Energy Commission, including technical assistance and training is essential. Ideally, privatization should occur by 2000, before the next election. There are no government funds to invest in infrastructure. Privatization is being delayed and during the transition period the government will not sign new contracts for generation unless there is a power supply emergency. Honduras is further behind in restructuring and privatizing its electricity sector as are Guatemala, El Salvador and Nicaragua. The political commitment to this process is not confirmed; this is evidenced by the weak nature of its federal institutions such as the National Regulatory Commission and Ministry of Environment and Natural Resources. The Government's interest in the regional electricity grid seems to be primarily for reliability reasons, rather than viewing the regional grid as an opportunity to achieve greater efficiencies and trade power over a broader regional market.

Recommendations

- Provide the Honduran Ministry of Energy and Natural Resources and the National Regulatory Commission with financial modeling and technical assistance. The Ministry needs to publish the Short Run Marginal Cost (SRMC), but has not done so (it was required by law to be published on January 15, 1999). Energy companies are very interested in receiving this information, as it's publication is necessary for Power Purchasing Agreements to be established.
- Assist in the development of partnership between regulatory body, Comision Nacional de Energia (CNE), and a US regulatory commission.
- Develop programs to train the personnel of the companies formed from the breakup of ENEE in the areas of development of whole sale markets, competition wheeling and other energy sector related issues.
- Develop market incentives such as providing PV panels to dramatically reduce the cost of systems to end users. This type of technical assistance will promote the reduction or elimination of importation taxes on renewable energy equipment. For

instance, in Mexico, the elimination of import duties through NAFTA has dramatically improved the ability of in-country suppliers to sell their systems at reasonable prices.

- Demonstrate, through pilot projects, how renewable energy systems can improve the management and conservation of protected⁷.
- Assist the Asociacion Nacional de Energia Renovable, comprised largely of private sector interests in developing a mandate that includes increased use of renewable energy and other distributed generation technologies in off-grid applications.

E. NICARAGUA

Data

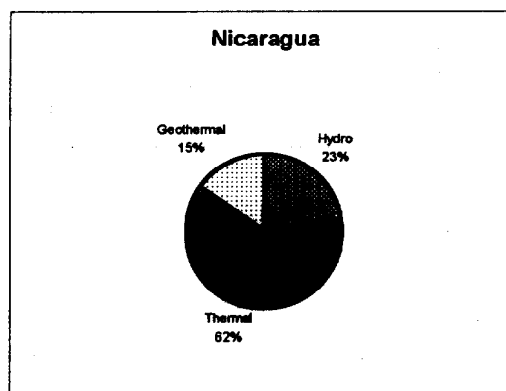
Population: 4,131,000
GDP per capita: \$340
Rural Population: 40%
Pop. With Electricity: 51%
% Rural Electrified: 29%
Capacity of Installed Elec. 380 MW – 26%
 hydro; 4%
 biomass; 4%
 geothermal;
 66% thermal.

Peak Demand: 385 MW (i.e. no reserves)

Fossil Fuels: Nicaragua has no meaningful resources of oil, gas or coal. Oil used in electric generation is imported.

Hydro and Geothermal: Nicaragua has an estimated untapped potential of over 7,000 MW (Geothermal: 1500-3000 MW)

Solar, wind, biomass: The Nicaraguan Institute of Energy (INE) is developing wind resource potential with the National Rural Electric Cooperative Association (NRECA).



INE - Instituto Nacional de Energia / National Energy Insitute:
 Octavio Salinas, President

ENEL – Empresa Nicaraguense de Electricidad / Nicaraguan Electric Company:
 Edgar Quintana, President

⁷ It is Important to learn about the activities of ENEE with the Canadian International development agency in areas of off-grid electric supply since there is a possible synergy.

Country Summary

Currently, Nicaragua has a national electrification rate of 50%. The Industrial Electric Law (La Ley de Industria Eléctrica) gives a specific time schedule for privatization to occur by April 2000. Due to a weak transmission system, Nicaragua is at a disadvantage regarding international trades in energy. Following years of neglect, Nicaragua's power system requires significant upgrading and expansion, particularly for transmission and distribution. Nicaragua's electricity restructuring and privatization program is very similar to that of Guatemala and El Salvador, although not as advanced. Currently, there is competition in the generation market with Empresa Nicaragüense de Electricidad (ENEL) required to bid for all new capacity additions. Due to the pending restructuring however, few new contracts are being extended.

The new electricity law calls for privatization of the generation and distribution assets of ENEL. It is anticipated that an RFP for the sale of generation and distribution assets will be issued in September or October 1999, to be completed by April 2000. Following privatization, ENEL will become the transmission and central dispatch company.

Recommendations

- Provide technical training to Nicaragua's energy sector institutions to expand and upgrade Nicaragua's transition system. This will provide for growth in generation, increase transactions with other countries, and support development of SIEPAC.
- The Government of Nicaragua needs assistance in evaluating options for rural electrification and in developing funding mechanisms to support this program. For example, a portion of the proceeds from the sale of ENEL's assets could be used for this purpose.

VI. CONCLUSIONS

The Long-term energy vision for the Central American Energy market includes the following concepts:

- Universal access to essential electrical service for all the regions residents through both on-grid and off-grid technology applications.
- Realization of SIEPAC and a completely integrated regional energy market.
- Completion of privatization process for the formerly state-owned power companies
- Adequate policy and regulatory structure for private investment to actively develop power generation projects in the region.
- Adequate policy and regulatory structure for cogeneration to occur on the private sector side.
- Promotion of renewables (biomass, geothermal, small hydro, solar, and wind) for electricity generation as well as for non-electrical uses.
- Introduction of natural gas supplies in the region as an alternative fuel for power generation.
- Increase in Rural Electrification projects that emphasize distributed generation projects with renewable energy and clean technology applications.
- Develop in-country technical and managerial capabilities needed to develop and operate renewable energy, joint implementation, and distributed generation programs.